भारतीय मानक
Indian Standard

IS 10951 : 2020

संकचन और बहिर्वेधन के लिए पोलीप्रोपयलीन सामग्री की विशिष्टि

(दूसरा पुनरीक्षण)

Specification for Polypropylene (PP) Materials for Moulding and Extrusion

(Second Revision)

ICS 83.080.20

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FOREWORD

This Indian Standard (Second Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Plastics Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

Polypropylene (PP) is another member of the polyolefin family, since its monomer, propylene, is an unsaturated hydrocarbon and belongs to a class of chemical compounds called olefins. Because the monomers of polypropylene (propylene) and polyethylene (ethylene) are so similar, the polymers have many of the similar properties. However, there are several major differences, including density (polypropylene's is lower), service temperature (polypropylene's is higher), rigidity (polypropylene is more rigid), resistance to environmental stress cracking (polypropylene's resistance is higher), and susceptibility to oxidation (polypropylene is worse than polyethylene). Polypropylene is characterized by good mechanical properties, excellent chemical and thermal as well as electrical properties and aesthetic appeal in applications such as clear films. Its lower cost per unit weight and high yield on a volume basis, due to the low density, offers considerable economic advantage to the converter and end-user.

Polypropylene may be processed by extrusion, injection moulding, and blow moulding. It may be further processed by compression moulding and thermoforming.

This standard was first published in 1984 with the title 'Specification for polypropylene and propylene — Copolymer thermoplastics — Designation'.

In this first revision the following changes have been made:

a) The title and scope have been modified.
b) The designation system has been thoroughly revised to align the same as far as possible with the corresponding ISO standard. The types are differentiated from each other by a classification system based on the appropriate levels of designator properties, such as flexural modulus Izod impact strength, melt flow rate (MFR) and information about intended application, method of processing important characteristics, additives, colour, fillers and reinforcing materials.
c) The basic concept of type (product approval) and acceptance (product identification) tests have been introduced to make this standard more meaningful. On the basis of type test the product identification criteria is derived and fixed and the values obtained for various acceptance tests become the controlling specifications.

In this revision the following changes have been made:

a) Title of the standard has been modified;
b) Designation system has been modified;
c) Sampling procedures have been modified; and
d) Reference of other publications have been incorporated.

This revision does not provide engineering and performance data which may be required to specify a material for a particular application or method of processing.

Considerable assistance has been derived from ISO 19069-1 : 2015 'Plastics — Polypropylene (PP) moulding and extrusion materials — Part 1: Designation system and basis for specifications' and ISO 19069-2 : 2016 'Plastics — Polypropylene (PP) moulding and extrusion materials — Part 2: Preparation of test specimens and determination of properties' issued by the International Organization for Standardization (ISO) while preparing this revised version of the standard.

For the typical additional properties specified in **6.3.2** of this standard, the purchaser should establish his own correlation between the properties of the processed articles and the material properties required for their achievement.

The composition of the Committee responsible for formulation of this standard is given in Annex C.

For the purpose of deciding whether a particular requirement of this standard is complied with the final value, observed or calculated, expressing the result of a test or analysis shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

SPECIFICATION FOR POLYPROPYLENE (PP) MATERIALS FOR MOULDING AND EXTRUSION

(Second Revision)

1 SCOPE

1.1 This standard prescribes the designation system, requirements, methods of sampling and tests for polypropylene (PP) thermoplastics material. It applies to the material ready for normal use in the form of powder, granules or pellets and to materials unmodified or modified by additives, fillers, etc.

1.2 This standard is applicable to all propylene homopolymers and to copolymers of propylene as prescribed in **3.3** and **3.4** (b) IS 16738.

1.3 It is not intended to imply that materials having the same designation give necessarily the same performance. This standard does not provide engineering data, performance data or data on processing conditions which may be required to specify a material for a particular application and/or method of processing.

If such additional properties are required, they shall be determined in accordance with the test methods specified in **6.3.2** if suitable.

1.4 This standard does not cover master batches.

2 REFERENCES

The Indian standards listed in Annex A contain provisions which, through reference in this text, constitute provisions of the standard. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed in Annex A.

3 DESIGNATION

3.1 The designation system is given in **3.2** into which the materials are classified according to method of processing, their designator property, such as melt flow rate. Additionally, certain other supplementary information such as flexural modulus and Izod impact strength shall be used for PP compounds. The designation system is only intended to indicate a broad classification. In most circumstances specific values of the designator properties and other characteristics as given in **6** shall be required.

3.2 Designation shall consist of following information given in the order presented and shall be codified in different blocks as indicated below:

3.2.1 *Designation Code for Polypropylene Material*

Data Block 1	For Indian Standard
Data Block 2	Identification of the resin by its symbol and information about the composition of the polymer (*see* **3.3**)
Data Block 3	Position 1: Intended application or method of processing (*see* **3.4**). Positions 2 to 3: Important characteristics, additives and supplementary information (*see* **3.4**). This block has three fields for intended application or method of processing, performance additives and supplementary information deemed to be of importance by the producer with respect to the end applications.
Data Block 4	Designator properties (*see* **3.5**)

3.2.2 *Designation Code for Polypropylene Compounds*

Data Block 1	For Indian Standard
Data Block 2	Identification of the Compounds by its symbol and information about the composition of the polymer (*see* **3.3**)
Data Block 3	Position 1: Intended application or method of processing (*see* **3.4**). Positions 2 to 3: Important characteristics, additives and supplementary information (*see* **3.4**).
Data Block 4	Designator properties (*see* **3.5**).
Data Block 5	Fillers or reinforcing materials and their nominal content (*see* **3.6**).
Data Block 6	For the purpose of specifications, an optional sixth block may be added containing additional information

There will be no space or hyphen between two alphabets/number within a block except block 1 (for Indian Standard), but each block will be separated by a space or hyphen. Each block is restricted with maximum number of letter/numbers as mentioned in **3.8**.

3.2.3 *Data Block 1* — For Indian Standard.

3.3 Data Block 2

In this block, type of material represented by one numeric code as given in Table 1. Additional information on the composition of the polymers also given in Table 1.

Table 1 Code for Identification of Polymer and Additional Information on the Composition in Data Block 2

(*Clause* 3.3)

Code	Type of Material	Additional Information on the Composition of Polymer
(1)	(2)	(3)
i)	Propylene homopolymers	—
ii)	Polypropylene random copolymers or terpolymers	Thermoplastic propylene random copolymer containing another olefinic monomer (or monomers) having no functional group other than the olefinic group, copolymerized with propylene
iii)	Polypropylene impact co-polymers	Thermoplastic propylene impact copolymer consisting of two or more phases of either a propylene plastic H "1" or a propylene plastic R "2" and rubber phases composed of propylene and another olefinic monomer (or monomers) having no functional group other than the olefinic group, added *in-situ* or physically blended with the propylene plastic matrix.
iv)	Polypropylene based compounds	—

3.4 Data Block 3

In this block, information about intended application and/or method of processing is given in position 1 and important characteristics, additives and supplementary information is given in positions 2 and 3. Code for position 1 is given in Table 2 and Code for position 2 and 3 is given in Table 2A.

Table 2 Code for Position 1 in Data Block 3

(*Clause* 3.4)

Code	Intended Application and/or Method of Processing
(1)	(2)
A	Compounding
B	Blow moulding
C	Nonwoven
D	Thermoforming
E	Extrusion of profiles and sheet
F	BOPP film (biaxially oriented PP film)
G	General use/purpose
H	Extrusion coating/lamination
J	Battery containers
K	CPP film (cast PP film)
L	Mono and multifilament filament yarn
M	Injection moulding
N	TQPP film (tubular PP film)
P	Extrusion of pipes/ducts
Q	Compression moulding
R	Rotational moulding
T	Tape extrusion/raffia
Z	Others

Table 2A Code for Position 2 and 3 in Data Block 3

(*Clause* 3.4)

Code	Characteristics, Additives and Supplementary Information
(1)	(2)
A	Barefoot grade without any additive
B	Stabilized with antioxidant
C	Heat aging stabilizer
D	UV stabilizer and antioxidant
E	No slip/no anti-blocking
F	Slip/no anti-blocking
G	No Slip/anti-block
H	Slip and anti-blocking
J	Mould release and/or antistatic agent
K	Lubricated or with polymer processing aid
L	Clarifier/nucleating agent
M	Suitable for insulation/sheathing with added antioxidant
N	Coloured/pigmented
O	Metal deactivator/acid scavenger
P	Special modified burning characteristics
Q	Natural (unpigmented)
R	UV stabilizer and antioxidant with carbon black
S	Impact modifier
X	Cross linking agent
T	Increased electrical conductivity
U	Pro-degradants
V	Peroxide for visbreaking
Z	Miscellaneous

3.5 Data Block 4

In this Block 4, 3 alphabets shall be used, first one for MFR/MFI, second one for flexural modulus and third one for izod impact strength.

For Polypropylene materials (symbol 1, 2 and 3) and Polypropylene compounds (symbol 4), MFI Code to be mentioned as per designatory code in Table 3 (*see* **3.5.1**). For polypropylene compounds (symbol 4), flexural modulus (as per Table 4, **3.5.2**) and izod impact strength (as per Table 5, **3.5.3**) to be mentioned as additional properties, if it is required as per agreement between purchaser and supplier.

3.5.1 *Melt Mass Flow-Rate (MFR) or Melt Flow Index (MFI)*

The melt flow-rate (mass) shall be determined in accordance with IS 13360 (Part 4/Sec 1)/ASTM D1238 at 230°C with a load of 2.16 kg. The possible values of melt flow rate are divided into seven ranges, each represented by a one-alphabet code as specified in Table 3.

Table 3 Codes and Ranges for Melt Mass Flow Rate (MFR) in Block 4

(*Clause* 3.5.1)

Code	MFR at 230°C, 2.16 kg (g/10 min)
(1)	(2)
A	0.01 to ≤ 6.0
B	>6.0 to ≤ 10.0
C	>10.0 to ≤ 16.0
D	>16.0 to ≤ 30.0
E	> 30.0 to ≤ 50.0
F	> 50.0 to ≤ 80.0
G	> 80.0

NOTES:

1 MFR or MFI of polypropylene compounds material resin will depend on the type and loading of its different ingredients. It can be determined based on the agreement between purchaser and supplier.

2 The producer will use the code for the nominal MFI/MFR value (usually the mid-point of the range or Target value of the individual product specification) of respective grades while designating any grade.

3.5.2 *Flexural Modulus*

The flexural modulus shall be determined in accordance with IS 13360 (Part 5/Sec 7)/ASTM D 790. The possible values of flexural modulus are divided into six ranges, each represented by a one-alphabet code as specified in Table 4.

Table 4 Codes and Ranges for Flexural Modulus in Block 4

(*Clause* 3.5.2)

Code	Range of Flexural Modulus (MPa)
(1)	(2)
A	≤ 400
B	> 400 to ≤ 800
C	> 800 to ≤ 1200
D	> 1200 to ≤ 2000
E	> 2000 to ≤ 3500
F	> 3500

3.5.3 *Izod Impact Strength*

The notched izod impact strength shall be determined in accordance with IS 13360 (Part 5/Sec 4)/ASTM D 256. The possible values of notched izod impact strength are divided into seven ranges, each represented by one alphabet code as specified in Table 5.

Table 5 Codes and Ranges for Izod Impact Strength in Block 4

(*Clause* 3.5.3)

Code	Izod Impact Strength, J/m
(1)	(2)
A	≤ 30
B	> 30 to ≤ 60
C	> 60 to ≤ 120
D	> 120 to ≤ 200
E	> 200 to ≤ 300
F	> 300 to ≤ 500
N	> 500

3.6 Data Block 5

In this block, the type of filler and/or reinforcing material is represented by a single code in position 1 and its physical form by a second code in position 2, as specified in Table 6. Subsequently (without a space), the mass content shall be given by a one digit (in case of < 9.5 percent) or two-digit (in case of ≥ 9.5 percent) number (Round figure) in positions 3 and/ or 4.

Table 6 Code for Fillers and Reinforcing Materials in Block 5

(*Clause* 3.6)

Code	Material	Code	Form
(1)	(2)	(3)	(4)
B	Boron	B	Beads, spheres, balls
C	Carbon	D	Powder
G	Glass	F	Fiber
K	Calcium carbonate	G	Ground
L	Cellulose	H	Whiskers
M	Mineral, metal, mineral fillers	Z	Others
S	Synthetic, organic		
T	Talc		
W	Wood		
Z	Others		

3.7 Data Block 6

Indication of additional requirements in this optional block is a way of transforming the designation of a material into a specification for a particular application. This may be done for example by reference to a suitable published Indian standard.

a) These materials may be further defined by their chemical symbol. In the case of metals (M), it is essential to indicate the type of metal by means of its chemical symbol.

b) Mineral fillers shall be designated more precisely if a symbol is available.

Mixtures of materials and/or forms may be indicated by combining the relevant codes using the sign "+" and placing the whole between parentheses. For example, a mixture of 25 percent glass fiber (GF) and 10 percent mineral powder (MD) would be indicated by (GF25+MD10)

3.8 Coding Examples

There will be no space or hyphen between two alphabets/number within a block except block 1 (for Indian Standard). But each block will be mentioned and separated by a space or hyphen. The designatory code shall be formed as per below table. Each block is restricted with maximum number of letter/ number as mentioned below.

Data Block 1	IS 10951
Data Block 2	Maximum one character (1 character for Polymer),
Data Block 3	Maximum three characters (1 character for application and 1 or 2 character for additives),
Data Block 4	Maximum three characters (1 character for MFI and 2 characters for flexural and izod)
Data Block 5	Maximum four characters (2 characters for reinforcing material and their physical form and 1 or 2 characters for mass content percentage)
Data Block 6 (Optional)	Maximum eleven characters (Combination of different reinforcing material with dosing percentage and separated by Plus sign including the Bracket in beginning and end as per clause **3.7**)

Typical Example of Designatory Code:

Typical Example of Designatory Code											
Designation Code : IS 10951-4-MJC-BDE-GF16-(25TD+12CF)											
	IS 10951	4	M	J	C	B	D	E	GF	16	25TD+12CF
Data Block 1	Indian Standard	Compound	Injection molding	Antistatic agent	Heat ageing stabilizer	>6 to ≤10 g/10 min	> 1200 to ≤ 2000 MPa	> 200 to ≤ 300 J/m	Glass fiber as reinforcing agent	16.4 percent loading of glass fiber	25.1 percent talc powder (TD) and 11.9 percent carbon fiber (CF)
Data Block 2	Material										
Data Block 3	Application or processing method										
	Additives										
	Supplementary information/special additive										
Data Block 4	MFI at 230°C at 2.16 kg load										
	Flexural modulus										
	Izod impact										
Data Block 5	Fillers and reinforcing material and their physical forms										
	Mass content of fillers and reinforcing material										
Data Block 6	Combination of different reinforcing materials with dosing percentage (optional)										

NOTES — Data block 4 (flexural and izod impact), block 5 and 6 is additional requirement for polypropylene compounds only.

3.8.1 *Example of Polypropylene Resin*

A polypropylene homopolymers (1) intended for film extrusion (F), which is stabilized with antioxidant (B) and additionally slip and antiblock (H) is added having melt flow rate of 10 g/10 min (B), shall be designated as:

Data Block	Block 1	Block 2	Block 3	Block 4
Terminology	IS 10951	1	FBH	B
Designation code	IS 10951	1-FBH-B		

3.8.2 *Example of Polypropylene Compound*

A propylene compound (4) for injection moding application (M), with nucleating agent (L) and impact modifier (S) having a melt flow rate of 3.5 g/10 min (A), flexural modulus of 1200 MPa (C) and an impact strength of 225 J/m (E). This is also modified with 15 percent talc (T) in powder form (D), which would be designated as:

Data Block	Block 1	Block 2	Block 3	Block 4	Block 5
Terminology	IS 10951	4	MLS	ACE	TD15
Designation Code	IS 10951	4-MLS-ACE-TD15			

4 PREPARATION OF TEST SPECIMEN FOR POLYPROPYLENE COMPOUND

It is essential that specimens are always prepared by the same procedure (injection moulding), using the same processing conditions as given in **4.2**. The procedure to be used for each test method is indicated in Table 7.

4.1 Treatment of the Material before Moulding

Before processing, no pretreatment of the material sample is normally necessary.

4.2 Injection Moulding

Injection moulded specimens shall be prepared in accordance with ASTM D 4101 using the conditions specified in Table 7.

5 CONDITIONING

Test specimens shall be conditioned in standard atmospheric condition of temperature 23 ± 2°C and percent relative humidity of 50 ± 10 percent before performing the required tests. The conditioning may change as per applicable standard for testing of the respective properties.

Test shall be conducted in the standard atmospheric condition as mentioned in the applicable test method.

6 REQUIREMENTS

6.1 The material shall be uniform and free from foreign matter.

6.2 Property Requirements

6.2.1 *Minimum Requirements*

The minimum properties required to be measured for polypropylene materials and polypropylene compounds is melt mass flow rate (MFR) or melt flow rate (MFI). The flexural modulus and izod impact strength is additional requirement for the polypropylene compounds.

6.2.1.1 *Melt mass-flow rate (MFR)*

The melt mass flow rate of the material shall be as agreed to between the purchaser and the supplier and shall be determined by the method prescribed in IS 13360 (Part 4/Sec 1)/ASTM D 1238. The value of melt flow rate shall be within ± 20 percent of the specified nominal melt flow rate, if this is 1 g/10 min or above and shall be within ± 30 percent of the specified nominal melt flow rate, if this is less than 1 g/10 min.

6.2.1.2 *Flexural modulus*

The flexural modulus of the material shall be as agreed to between the purchaser and the supplier and shall be determined by the method prescribed in

Table 7 Conditions for Injection Moulding of Test Specimens

(*Clause* 4.2)

MFR (g/10min)	*Melting resin temperature (°C)	Mold temperature (°C)	Average melting resin speed (mm/min)	Pressure keeping time (s)	Injection Pressure and Speed	**Total cycle time (s)	Back Pressure (MPa)
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<1.0	250 – 270 (*see* note 1)	60 ± 3	200 ± 100	20	Note 2	45	0.7
1.0-1.5	250	60 ± 3	200 ± 100	20		45	0.7
1.6-2.5	240	60 ± 3	200 ± 100	20		45	0.7
2.6-4.0	230	60 ± 3	200 ± 100	20		45	0.7
4.1-6.5	220	60 ± 3	200 ± 100	20		45	0.7
6.6-10.5	210	60 ± 3	200 ± 100	20		45	0.7
10.6-17.5	200	60 ± 3	200 ± 100	20		45	0.7
17.6-30.0	190	60 ± 3	200 ± 100	20	Note 3	45	0.7
>30.0	190	60 ± 3	200 ± 100	20		45	0.7

NOTES —

1 Should be raised in 5°C increments from 250°C until the part weight of the entire shot is equivalent to the part weight of 1 to 5 g/10 min material.

2 Use the single stage pressure. Injection speed and pressure shall be set to produce equal part weights (including sprue and runners ± 2 percent) regardless of MFR.

3 Injection and hold pressure shall be specified by manufacturer. In this range, injection and hold pressure may be set different pressures.

* Melting resin temperature. It is to be measured at accuracy of ±3°C.

** The total moulding cycle time shall be 45 (s) consisting of Injection(20s), cooling(20s), Mould open (5s).

IS 13360 (Part 5/Sec 7)/ASTM D 790. The value of flexural modulus shall be within ± 20 percent of the specified flexural modulus, if this is 1200 MPa or above and shall be within ± 30 percent of the specified flexural modulus, if this is less than 1200 MPa.

6.2.1.3 *Izod impact strength*

The izod impact strength of the material shall be as agreed to between the purchaser and the supplier and shall be determined by the method prescribed in 13360 (Part 5/ Sec 4)/ASTM D 256. The value of izod impact strength shall be within ± 20 percent of the specified izod impact if this is less than 120 J/m and shall be within ± 30 percent of the specified izod impact strength if this is 120 J/m or above.

6.3 Additional Requirements

6.3.1 Additional Properties to be selected as per **6.3.2** for compounds or an article shall be determined by the characteristics required for processing and product property requirements.

NOTE — The purchaser should establish his own correlation between the properties of the processed article and the material properties required for their achievement achieving the desired results.

6.3.2 *Typical Additional Properties*

The typical additional properties are as per the agreement between the purchaser and supplier. The typical additional properties to be measured along with recommended test methods are given in Table 8. Available ASTM/ISO Standards may also be used for the measurement of typical additional properties.

6.4 Special Requirements for Foodstuffs, Pharmaceuticals and Drinking Water Applications

6.4.1 All additives used in the material which is meant for usage in contact with foodstuffs, pharmaceuticals and drinking water are given in IS 16738 for guidance purpose only.

6.4.2 When the products are used in contact with foodstuffs, pharmaceuticals and drinking water, its

Table 8 Typical Additional Properties and Recommended Test Methods

(*Clause* 6.3.2)

Sl No.	Property	Method of Test, Ref to
(1)	(2)	(3)
i)	Mechanical Properties	
	a) Tensile yield strength, MPa	IS 13360 (Part 5/Sec 1) and IS 13360 (Part 5/Sec 2)
	b) Elongation at yield, percent	
	c) Tensile strength at break, MPa	
	d) Elongation at break, percent	
	e) Charpy impact strength, KJ/m^2	IS 13360 (Part 5/Sec 5)
	f) Hardness – Rockwell, R	IS 13360 (Part 5/Sec 13)
	– Shore, D	IS 13360 (Part 5/Sec 11)
ii)	Thermal Properties ºC	
	a) Melting temperature,	IS 13360 (Part 6/Sec 10)
	b) Temperature of deflection under load, ºC	IS 13360 (Part 6/Sec 3) IS 13360 (Part 6/Sec 17)
	c) Vicat softening temperature, ºC	IS 13360 (Part 6/Sec 1)
	d) Flammability, mm/min	IS/ IEC 60695-11-10
	e) Ignitability (Oxygen index), percent	IS 13360 (Part 6/Sec 19)
iii)	Electrical Properties	
	a) Relative permittivity	IS 4486
	b) Dissipation factor	IS 13360 (Part 7/Sec 1)
	c) Volume resistivity	IS 2071 (Part 1)
	d) Surface resistivity	
	e) Dielectric strength	IS 2584
iv)	Other properties	
	a) Water absorption	IS 13360 (Part 8/Sec 1)
	b) Density	IS 13360 (Part 3/Sec 10)/ IS 13360 (Part 3/Sec 11)

requirements with respect to the material shall also be met as per clause **3.3**, **3.4** and **3.5** of IS 10910.

7 TESTS

7.1 Classification of Tests

7.1.1 *Type Tests (Product Approval)*

The following shall constitute the type tests (product approval):

a) Melt mass flow rate (*see* **6.2.1.1**) for polypropylene material and polypropylene compounds;
b) Flexural modulus (*see* **6.2.1.2**) for polypropylene compounds only; and
c) lzod impact strength (*see* **6.2.1.3**) for polypropylene compounds only.

7.1.1.1 Polypropylene material and polypropylene compounds shall be subjected to product type approval in accordance with details given in Annex B.

7.1.2 *Acceptance Tests (Product Identification)*

7.1.2.1 All the tests which the purchaser shall establish out of those listed in **6.3.2** by correlating the properties of the processed article and the material properties required for their achievement.

7.1.2.2 The batch shall be accepted if the polypropylene material is found to comply with the requirements of acceptance (product identification) tests given in **7.1.2.1**.

8 PACKING AND MARKING

8.1 Packing

The material shall be packed in suitable form of packing, as agreed to between the purchaser and the supplier.

8.2 Marking

Each bag and/or unit package whichever is smallest in size that is being delivered to the customer shall be clearly marked with the following:

a) Name and type of the material,
b) Designation code,
c) Net mass of the material,
d) Batch number/ Lot number,
e) Month and year of manufacture of the material, and

NOTE — Batch number/lot number should reflect month and year of manufacture of the material. If not, it has to be printed separately as mentioned in (e).

f) Name of the manufacturer and trade mark; if any.

8.3 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per the conformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the products may be marked with the Standard Mark.

9 SAMPLING

9.1 General

In drawing, preparing, storing and handling samples, the precautions and directions given in **9.1.1** to **9.1.6** shall be observed.

9.1.1 Samples shall not be taken in an exposed place.

9.1.2 The sampling instrument shall be of stainless steel or any other suitable material on which the material shall have no action. The instrument shall be clean and dry.

9.1.3 Precautions shall be taken to protect the samples, the materials being sampled, the sampling instrument and the containers for samples from adventitious contamination.

9.1.4 The samples shall be placed in a suitable clean, dry, air tight, plastic, metal or glass container on which the material has no action. The sample container shall be of such a size that it is almost completely filled by the sample.

9.1.5 Each sample container shall be sealed air-tight with a stopper after filling and marked with full details of sampling such as the date of sampling, the month and year of manufacture of the material, etc.

9.1.6 Samples shall be stored in such a manner that the temperature of the material does not vary unduly from the normal temperature.

9.2 Scale of Sampling

9.2.1 *Lot/Batch*

For continuous chemical processes like polymer production, the sampling shall be done from sealed bags/packages or other representative sampling points after proper homogenization of the material.

To get the representative samples from the entire lot/ batch, random sampling to be done from the entire lots/batches irrespective of the size of lot/batch. The number of sampling to be done as per Table 9 based on the quantity of the lot/batch.

Table 9 Number of Containers to be Selected for Sampling

(*Clause* 9.2.1)

Lot Size (MT)	Number of the Sealed Bag / Package for Sampling
(1)	(2)
Up to 600	3
> 600 to 1000	4
> 1000	5

Approximately 1 kg (or higher quantity required for testing) of sample is to be collected from each of the above sealed bag in to a clean plastic bag to have approx. 3 kg composite sample. Proper mixing to be done for homogenization of composite sample before testing.

Based on the requirement of testing, the portion of the composite sample will be stored properly in two containers as mentioned in clause **9.1.4**. Sample of the one container will be used for testing in front of inspection authority at manufacturer site/laboratory. The other sample container will be stored (*Max* 6 months) and properly labelled as reference sample for the testing in future if it is required in case of any dispute or other requirement.

9.3 Sampling Instrument

9.3.1 The sampling instrument made of stainless steel shall be as shown in Fig. 1. It shall be capable of taking samples from all points when inserted into the container/bag. In case of FFS bag (multilayer film sack) sampling may be done by opening the bag.

9.3.2 From each of the containers/bags selected, portions of the material shall be drawn with the help of the sampling instrument. The total quantity of the material collected from each container/bag shall be sufficient to conduct tests for the determination of the various characteristics as required.

9.4 Number of Tests

9.4.1 Tests for the determination of melt flow rate shall be conducted individually from a portion of composite samples, kept in the bottle/container.

9.4.2 Tests for the determination of the remaining characteristics shall be conducted on the remaining portion of composite samples if it is required as per agreement between purchaser and supplier.

9.5 Criteria for Conformity

Each of the test results for melt flow rate, flexural and izod impact satisfies the corresponding requirements given in **6.2.1.1**, **6.2.1.2** and **6.2.1.3**.

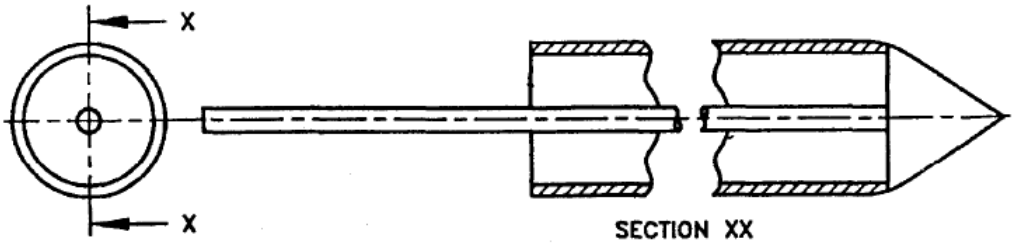

FIG. 1 SAMPLING INSTRUMENT

ANNEX A

(*Clause* 2)

LIST OF REFERRED INDIAN STANDARDS/ OTHER PUBLICATIONS

IS No./Other Publication	*Title*
IS 2071 (Part 1) : 2016	High-voltage test techniques: Part 1 General definitions and test requirements (*third revision*)
IS 2584 : 1963	Method of test for electric strength of solid insulating materials at power frequencies
IS 4486 : 1967	Recommended methods for the determination of the permittivity and dielectric dissipation factor of electrical insulating materials at power, audio and radio frequencies including metre wavelengths
IS 10910 : 1984	Specification for polypropylene and its copolymers for its safe use in contact with foodstuffs, pharmaceuticals and drinking water
IS 13360 (Part 3/ Sec 10) : 2016	Plastics — Methods of testing: Part 3 Physical and dimensional properties, Section 10 Determination of density of non-cellular plastics — Immersion method, liquid pyknometer method and titration method
IS 13360 (Part 3/ Sec 11) : 2016	Plastics — Methods of testing: Part 3 Physical and dimensional properties, Section 11 Determination of density of non-cellular plastics — Density gradient column method
IS 13360 (Part 4/ Sec 1) : 2000	Plastics — Methods of testing: Part 4 Rheological properties, Section 1 Determination of the melt mass flow rate (MFR) and the melt volume flow rate (MVR) of thermoplastics (*first revision*)
IS 13360 (Part 5/ Sec 1) : 2018	Plastics — Methods of testing: Part 5 Mechanical properties, Section 1 Determination of tensile properties — General requirements (*first revision*)
IS 13360 (Part 5/ Sec 2) : 2017	Plastics — Methods of testing: Part 5 Mechanical properties, Section 2 Determination of tensile properties — Test conditions for moulding and extrusion plastics (*first revision*)
IS 13360 (part 5/ Sec 4) : 2013	Plastics — Methods of testing: Part 5 Mechanical properties, Section 4 Determination of izod impact strength (*first revision*)
IS 13360 (Part 5/ Sec 5) : 2017	Plastics — Methods of testing: Part 5 Mechanical properties, Section 5 Determination of charpy impact properties — Non-instrumented impact test (*first revision*)
IS 13360 (Part 5/ Sec 7) : 2017	Plastics — Methods of testing: Part 5 Mechanical properties, Section 7 Determination of flexural properties (*first revision*)
IS 13360 (Part 5/ Sec 11) : 2013	Plastics — Methods of testing: Part 5 Mechanical properties, Section 11 Determination of indentation hardness by means of durometer (Shore Hardness) (*first revision*)
IS 13360 (Part 5/ Sec 13) : 1992	Plastics — Methods of testing: Part 5 Mechanical properties, Section 13 Determination of rockwell hardness
IS 13360 (Part 6/ Sec 1) : 2018	Plastics — Methods of testing: Part 6 Thermal properties, Section 1 Determination of vicat softening temperature of thermoplastic materials (*second revision*)
IS 13360 (Part 6/ Sec 3) : 2017	Plastics — Methods of testing: Part 6 Thermal properties, Section 3 Determination of temperature of deflection under load — General test method (*second revision*)

IS No./Other Publication	*Title*
IS 13360 (Part 6/ Sec 10) : 2013	Plastics — Methods of testing: Part 6 Thermal properties, Section 10 Determination of melting behaviour (melting temperature or melting range) of semi-crystalline polymers by capillary tube and polarizing — Microscope methods (*first revision*)
IS 13360 (Part 6/ Sec 17) : 2017	Plastics — Methods of testing: Part 6 Thermal properties, Section 17 Determination of temperature of deflection under load — Plastics and ebonite (*second revision*)
IS 13360 (Part 6/ See 19) : 2001	Plastics — Methods of testing: Part 6 Thermal properties, Section 19 Flammability by oxygen index — Ambient temperature test
IS 13360 (Part 7/ Sec 1) : 1996	Plastics — Methods of testing: Part 7 Electrical properties, Section 1 Measurement of resistivity of conductive plastics
IS 13360 (Part 8/ Sec 1) : 1997	Plastics — Methods of testing: Part 8 Permanence/ chemical properties, Section 1 Determination of water absorption
IS 16738 : 2018	Positive list of constituents for polypropylene, polyethylene and their copolymers for its safe use in contact with foodstuffs and pharmaceuticals
IS/IEC 60695-11-10 : 2013	Fire hazard testing: Part 11 Test flames, Sec 10 50 w horizontal and vertical flame test methods
ASTM D 256 : 2010	Standard test methods for determining the izod pendulum impact resistance of plastics
ASTM D 790 : 2017	Standard test methods for flexural properties of unreinforced and reinforced plastics and electrical insulating materials
ASTM D 1238 : 2013	Standard test method for melt flow rates of thermoplastics by extrusion plastometer
ASTM D 4101 : 2017	Standard classification system and basis for specification for polypropylene injection and extrusion materials

ANNEX B

(*Clause* 7.1.1.1)

PRODUCT TYPE APPROVAL

Polypropylene (PP) and polypropylene compounds of a particular designation for which the product/type approval is required shall be subjected to the tests melt flow rate (MFR). However, for polypropylene compound additionally flexural modulus and izod impact strength are required to be considered.

PP material of that particular designation successfully passing in these product/type approval tests shall be tested for other requirements (acceptance Tests/ Product Identification) as stipulated in **7.1.2** which would be recorded, and these shall be the controlling specifications.

As long as there is no change in the grade designation of the PP material, only acceptance test to be performed.

In the event of any change in the grade/designation of the PP material, reapproval will be required and the type tests shall be carried out afresh and the controlling specifications for acceptance test redetermined and fixed.

When the proposed changes are such that it may not be expected to significantly affect the performance (satisfactorily passing the type tests) the certifying/ testing authority may at its discretion recommend waiving complete reapproval or may require only partial reapproval in order to determine the significance and acceptability of the proposed changes and to redetermined the controlling specification for acceptance tests.

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

Plastics Sectional Committee, PCD 12

Organization	*Representative(s)*
Central Institute of Plastics Engineering and Technology (CIPET), Chennai	Prof (Dr) S. K. Nayak (***Chairman***)
Central Institute of Plastics Engineering and Technology (CIPET), Chennai	Dr S. N. Yadav
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Voluntary Organization in Interest of Consumer Education (VOICE), New Delhi	Shri M. A. U. Khan Shri H. Wadhwa (*Alternate*)

Organization	*Representative(s)*
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The Toy Association of India (TAI), New Delhi	Shri Rajesh Arora Shri R. K. Verma (*Alternate*)
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Amendments Issued Since Publication

Amend No.	Date of Issue	Text Affected

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